

AD-A041 591

OGDEN AIR LOGISTICS CENTER HILL AFB UTAH PROPELLANT L--ETC F/G 21/9.2
PROPELLANT SURVEILLANCE REPORT LGM-30 A AND B STAGE I TP-H1011.(U)

UNCLASSIFIED

APR 77 J A THOMPSON
MANCP-367(77)

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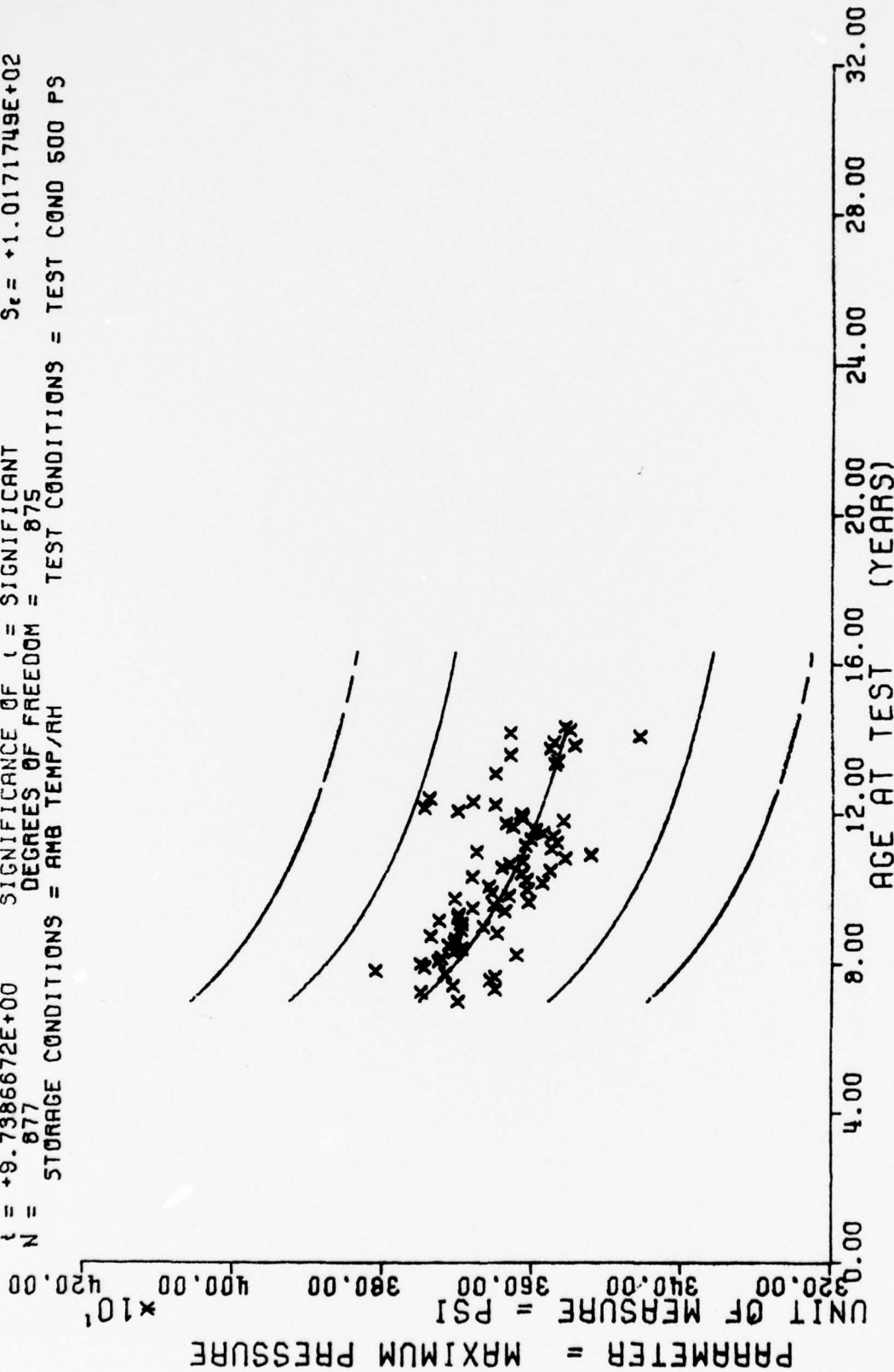
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
84.0	2	112.0	9	137.0	47
87.0	1	113.0	11	138.0	24
88.0	2	114.0	4	139.0	17
89.0	3	115.0	25	140.0	26
91.0	3	116.0	15	141.0	12
92.0	1	117.0	17	142.0	24
93.0	3	118.0	23	143.0	16
94.0	2	119.0	18	144.0	7
95.0	2	120.0	19	145.0	3
96.0	1	121.0	12	146.0	4
97.0	5	122.0	10	147.0	2
98.0	5	123.0	36	148.0	2
99.0	8	124.0	15	149.0	3
100.0	7	125.0	30	157.0	3
101.0	10	126.0	24	160.0	3
102.0	8	127.0	39	161.0	3
103.0	5	128.0	30	163.0	6
104.0	10	129.0	27	165.0	6
105.0	6	130.0	21	166.0	6
106.0	7	131.0	27	167.0	6
107.0	11	132.0	15	169.0	3
108.0	16	133.0	11	170.0	6
109.0	16	134.0	14	171.0	3
110.0	4	135.0	19	172.0	3
111.0	4	136.0	29		

STAGE 1, WING 152, PRESSURE TIME, MAXIMUM PRESSURE

This sample size summary is applicable to figures 51 and 52

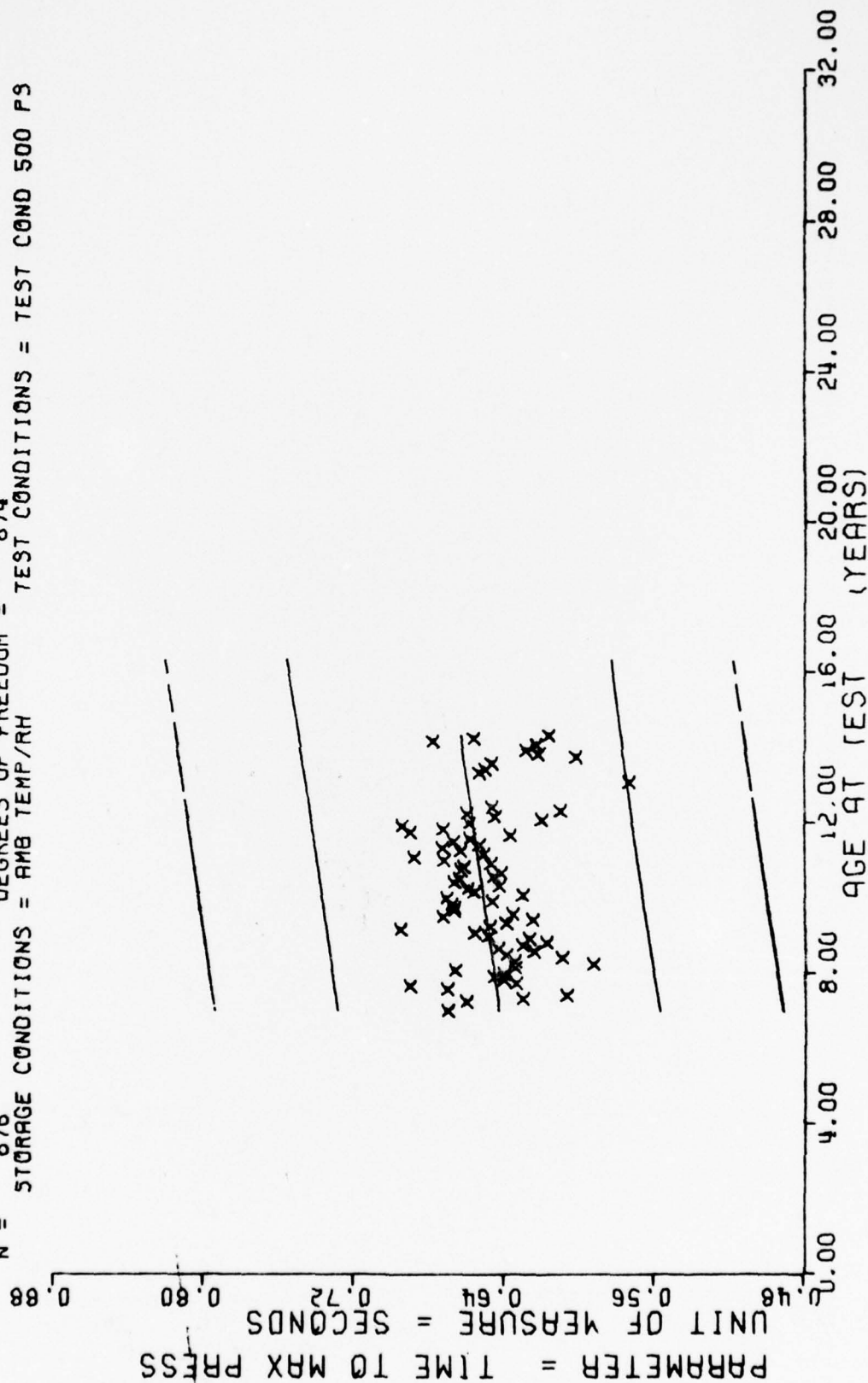
$F = +9.4841640E+01$ SIGNIFICANCE OF F = SIGNIFICANT $G = +1.0702716E+02$
 $R = +3.1271528E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +3.395922E+03$
 $t = +9.7386672E+00$ SIGNIFICANCE OF t = SIGNIFICANT $S_t = +1.0171749E+02$
 $N = 877$ DEGREES OF FREEDOM = 875
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = TEST COND 500 PS



STAGE 1, WING 142, PRESSURE TIME, MAXIMUM PRESSURE

FIGURE 51

$F = +4.8436227E+00$ SIGNIFICANCE OF F = $(+2.3701209E-04)$ * λ
 $R = +7.4238528E-02$ SIGNIFICANCE OF R = SIGNIFICANT
 $t = +2.2006232E+00$ SIGNIFICANCE OF t = SIGNIFICANT
 $N = 876$ DEGREES OF FREEDOM = 874
 $G = +5.0612266E-02$
 $S_e = +1.0769247E-04$
 $S_t = +5.0501469E-02$
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = TEST COND 500 P3



STAGE 1, WING 142, PRESSURE TIME, TIME TO MAXIMUM PRESSURE

FIGURE 52

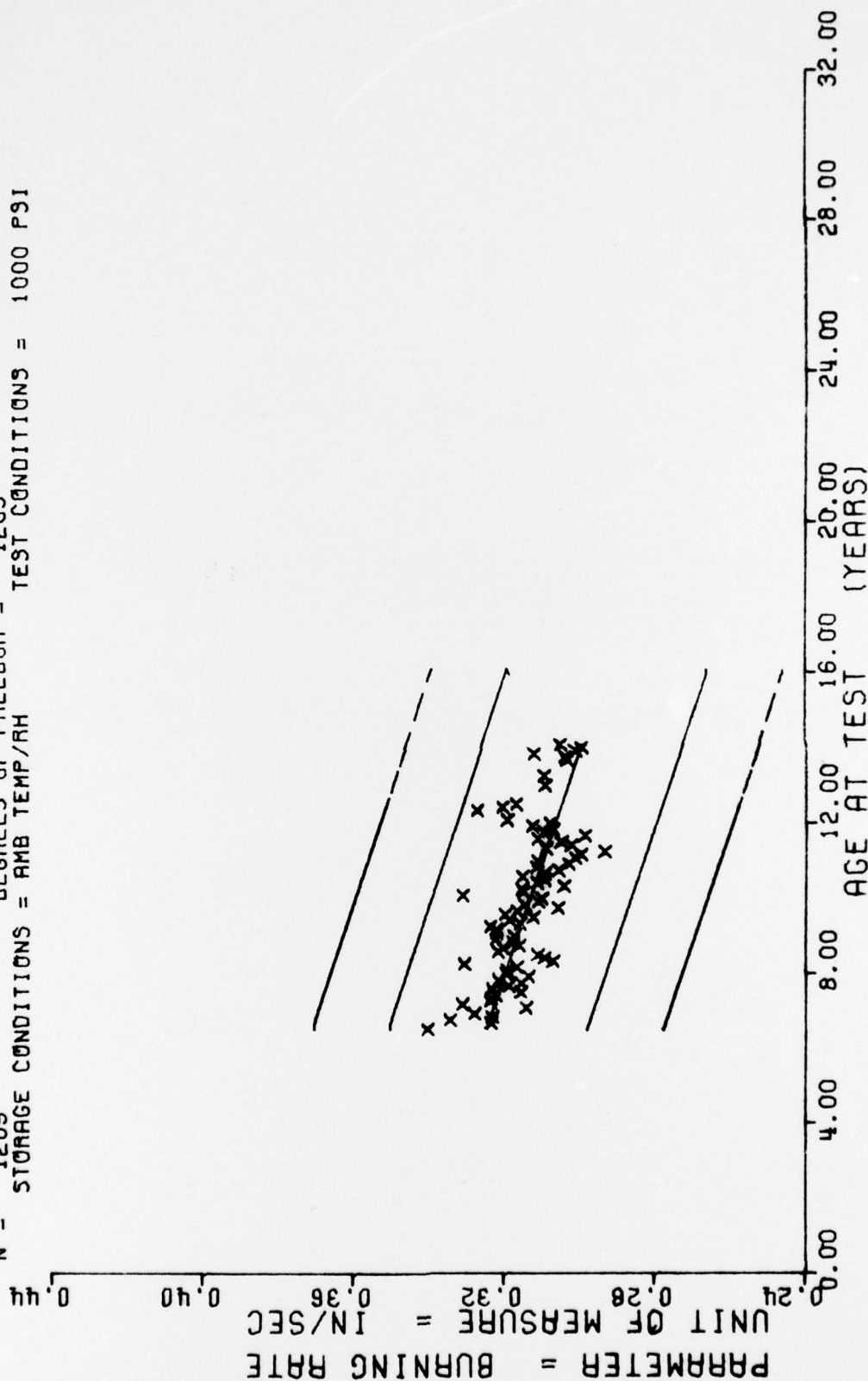
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
78.0	3	105.0	21	130.0	24	167.0	3
80.0	8	106.0	18	131.0	21	168.0	6
81.0	3	107.0	21	132.0	12	169.0	6
82.0	3	108.0	18	133.0	26		
83.0	9	109.0	15	134.0	36		
85.0	3	110.0	9	135.0	9		
86.0	3	111.0	24	136.0	51		
87.0	9	112.0	27	137.0	45		
88.0	12	113.0	21	138.0	33		
89.0	6	114.0	21	139.0	48		
90.0	3	115.0	18	140.0	18		
91.0	14	116.0	18	141.0	18		
92.0	15	117.0	45	142.0	9		
93.0	3	118.0	21	143.0	9		
94.0	3	119.0	18	144.0	9		
95.0	12	120.0	24	145.0	6		
96.0	9	121.0	18	146.0	3		
97.0	3	122.0	18	148.0	9		
98.0	9	123.0	26	149.0	3		
99.0	6	124.0	21	150.0	3		
100.0	6	125.0	24	156.0	3		
101.0	15	126.0	35	159.0	6		
102.0	18	127.0	23	164.0	3		
103.0	18	128.0	36	165.0	6		
104.0	15	129.0	29	166.0	3		

STAGE 1. WING ACH. TP-H1011. BURNING RATE 1000 PSI

This sample size summary is applicable to figure 53

$Y = \{ (+3.4598536E-01) + (-2.7786371E-04) \} \cdot X$
 $F = +1.1997331E+02$ SIGNIFICANCE OF F = SIGNIFICANT $G = +1.6217147E-02$
 $R = -3.0113884E-01$ SIGNIFICANCE OF R = SIGNIFICANT $S_0 = +2.5368192E-05$
 $t = +1.0953232E+01$ SIGNIFICANCE OF t = SIGNIFICANT $S_1 = +1.5470778E-02$
 $N = 1205$ DEGREES OF FREEDOM = 1203
 STORAGE CONDITIONS = AMB TEMP/AM TEST CONDITIONS = 1000 PSI



STAGE 1. WING A&B. TP-H1011. BURNING RATE 1000 PSI

FIGURE 53

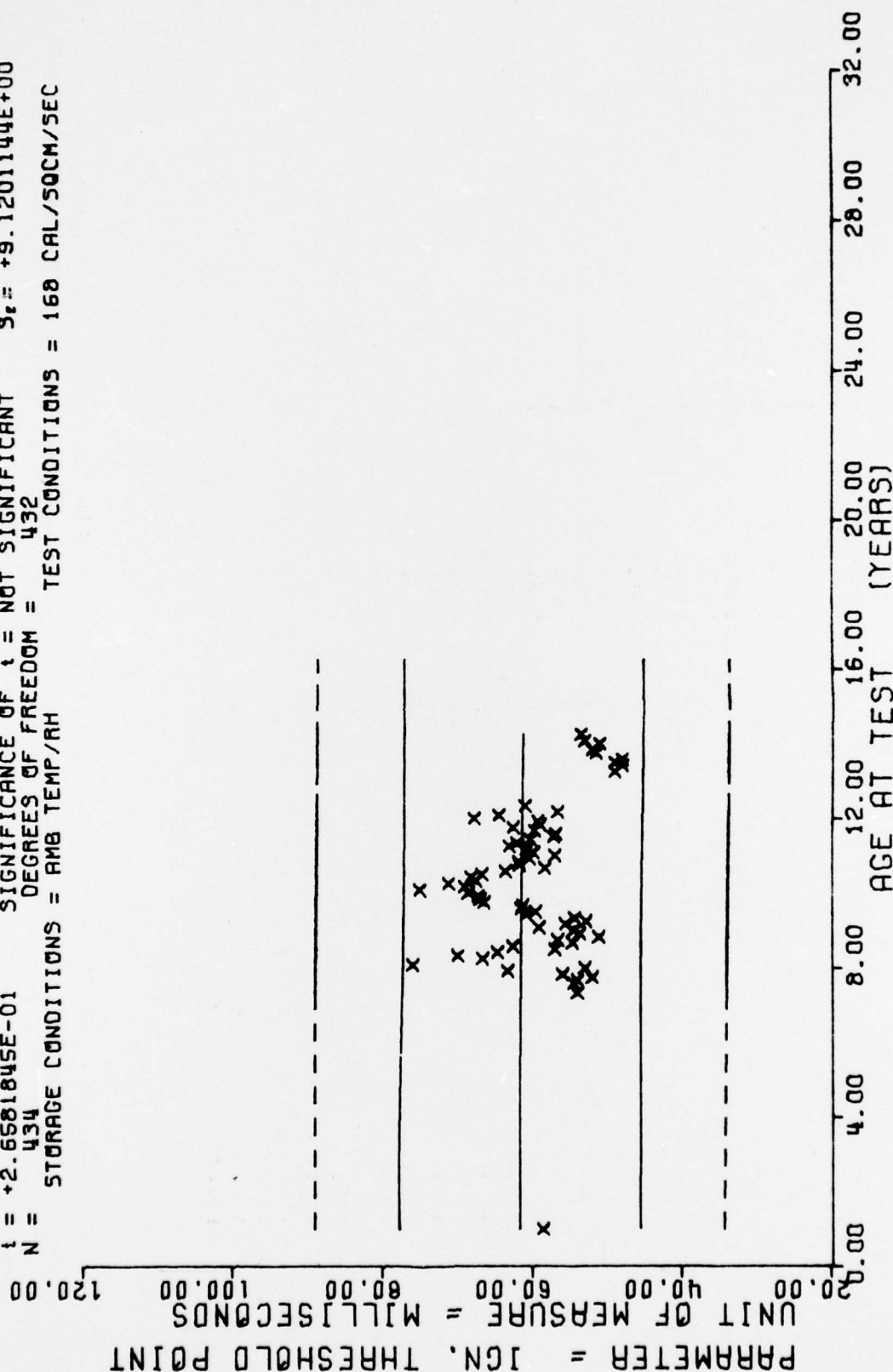
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
12.0	10	114.0	12	139.0	11
89.0	1	115.0	6	140.0	4
91.0	2	116.0	10	141.0	5
92.0	4	117.0	6	142.0	5
93.0	1	118.0	6	143.0	7
94.0	3	119.0	12	144.0	5
95.0	3	120.0	8	145.0	2
96.0	3	121.0	8	146.0	3
97.0	4	122.0	9	148.0	2
98.0	4	123.0	12	149.0	1
99.0	10	124.0	5	161.0	1
100.0	7	125.0	11	162.0	1
101.0	10	126.0	9	163.0	1
102.0	8	127.0	11	165.0	2
103.0	9	128.0	8	166.0	2
104.0	9	129.0	4	168.0	1
105.0	6	130.0	6	169.0	1
106.0	10	131.0	7	171.0	2
107.0	7	132.0	5		
108.0	12	133.0	9		
109.0	6	134.0	11		
110.0	8	135.0	8		
111.0	8	136.0	8		
112.0	12	137.0	8		
113.0	7	138.0	15		

STAGE 1 WING 162 TP-H101: IGNITABILITY. IGN THRESHOLD POINT. 168 CAL/SO CM/SEC

This sample size summary is applicable to figure 54

$F = +7.0659453E-02$ SIGNIFICANCE OF $F =$ NOT SIGNIFICANT $\alpha = +9.1103220E+00$
 $R = -1.2788150E-02$ SIGNIFICANCE OF $R =$ NOT SIGNIFICANT $S_e = +1.9179531E-02$
 $t = +2.6581845E-01$ SIGNIFICANCE OF $t =$ NOT SIGNIFICANT $S_e = +9.1201144E+00$
 $N = 434$ DEGREES OF FREEDOM = 432
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 168 CAL/50CM/SEC



STAGE 1 WING 142 TP-H1011 IGNITABILITY, IGN THRESHOLD POINT, 168 CAL/50 CM/SEC

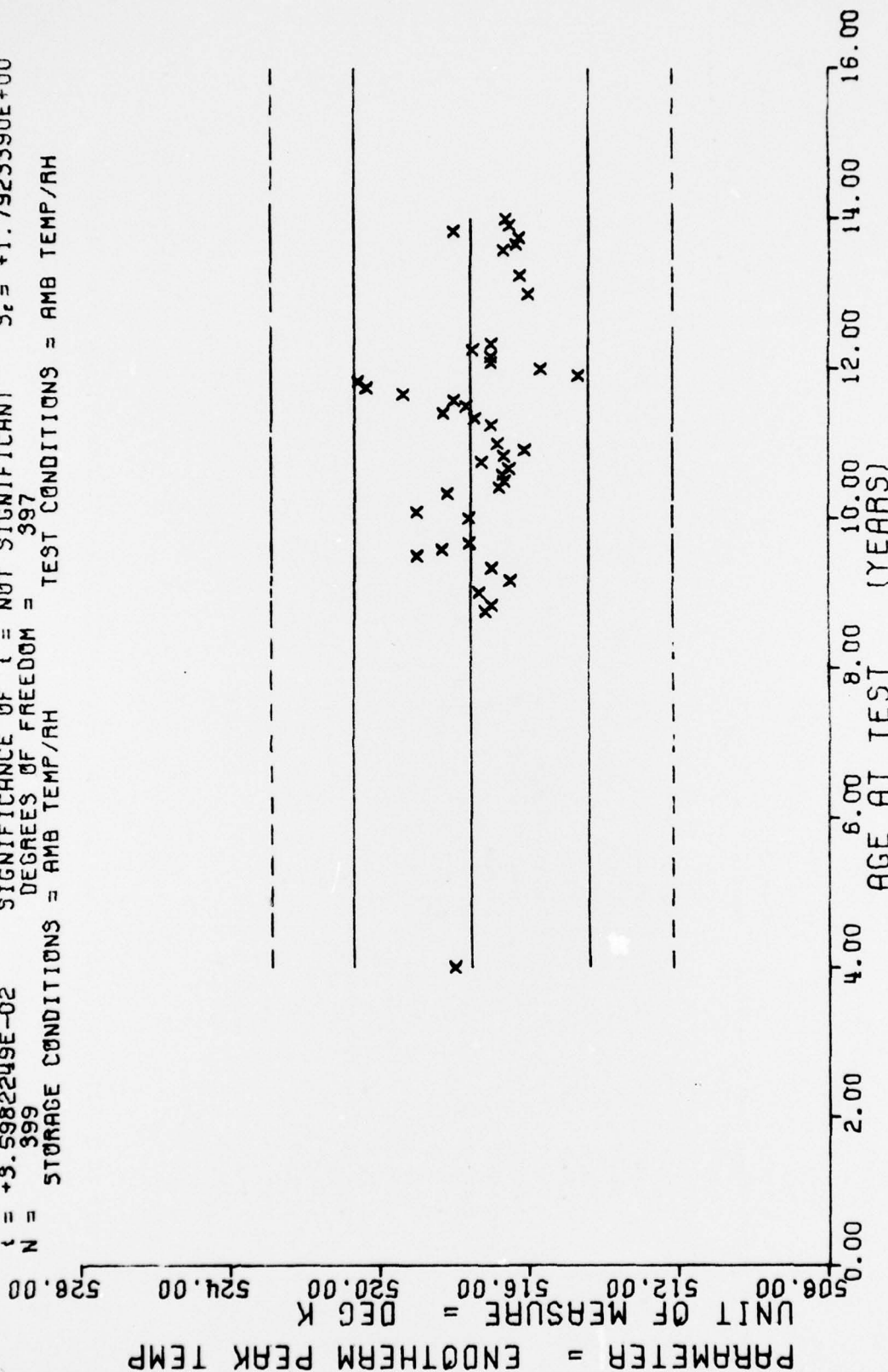
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
48.0	3	140.0	23
105.0	12	141.0	15
106.0	6	142.0	9
108.0	24	143.0	3
110.0	12	144.0	3
112.0	12	145.0	5
114.0	6	146.0	7
115.0	12	147.0	6
116.0	15	148.0	3
120.0	5	156.0	3
121.0	9	159.0	9
124.0	16	163.0	3
125.0	15	164.0	3
126.0	3	165.0	4
127.0	21	166.0	1
128.0	19	167.0	6
129.0	11	168.0	5
130.0	9		
131.0	9		
132.0	12		
135.0	7		
136.0	11		
137.0	14		
138.0	6		
139.0	22		

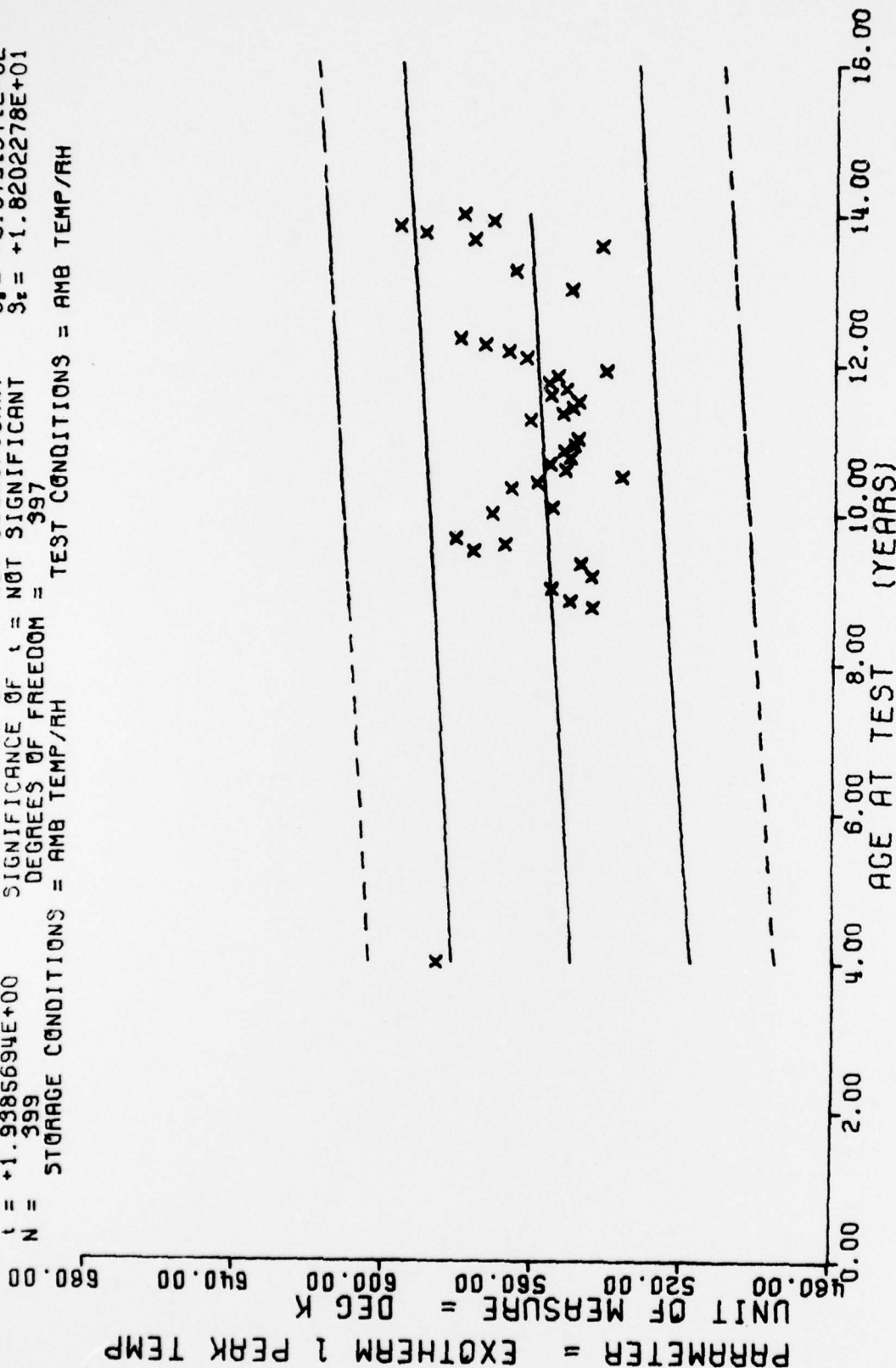
STAGE I WING 162 DIFFERENTIAL SCANNING CALORIMETER ENDOTHERM PEAK TEMP

This sample size summary is applicable to figures 55 thru 57

F = +1.2947222E-03
 R = -1.8058943E-03
 I = +3.5982249E-02
 N = 399
 STORAGE CONDITIONS = AMB TEMP/RH
 Y = { (+5.1755606E+02) + (-1.9044618E-04) * X }
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF I = NOT SIGNIFICANT
 DEGREES OF FREEDOM = 397
 TEST CONDITIONS = AMB TEMP/RH



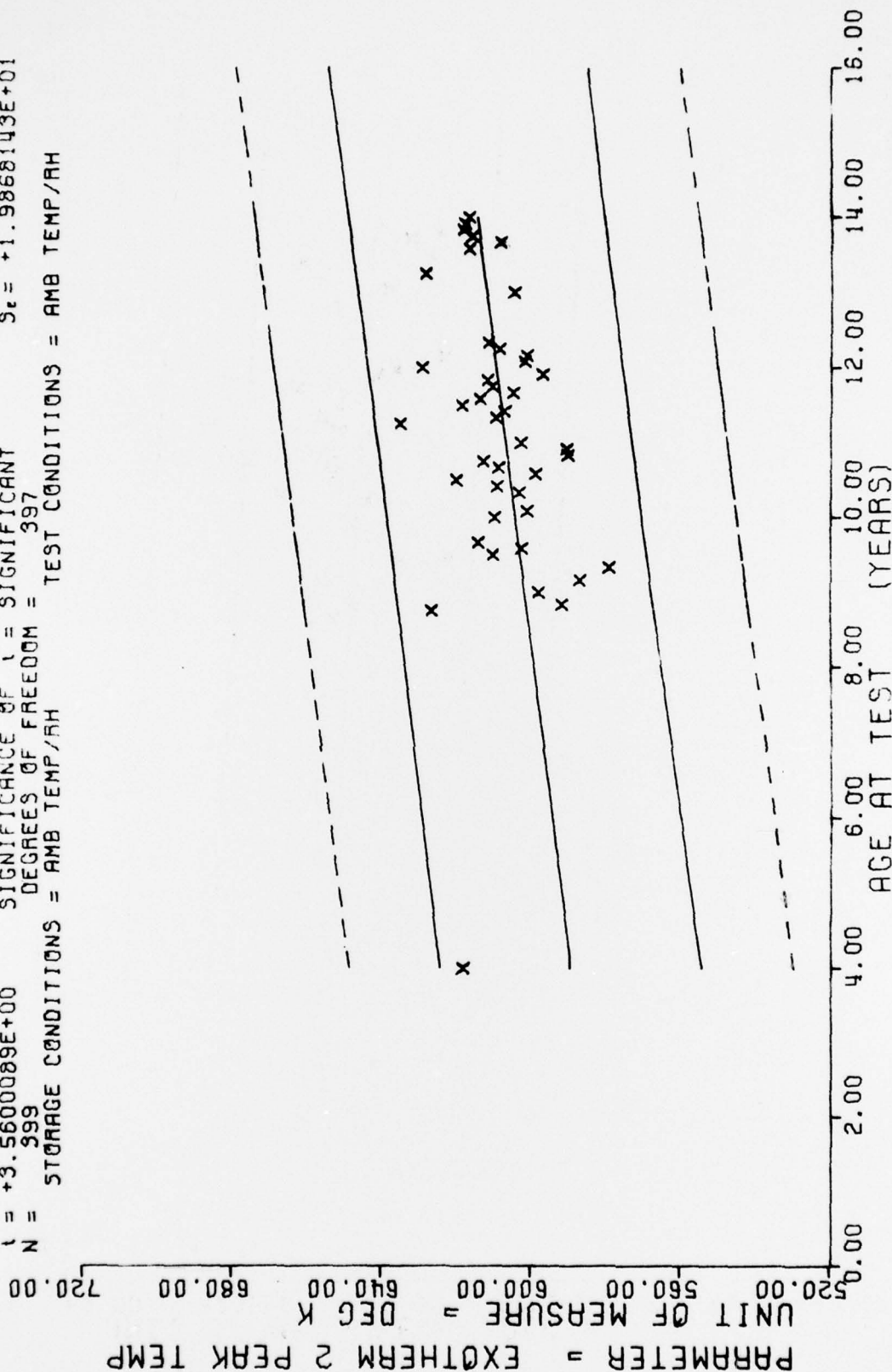
$F = +3.7580516E+00$
 $R = +9.6836759E-02$
 $t = +1.9385694E+00$
 $N = 399$
 STORAGE CONDITIONS = AMB TEMP/RH
 $Y = ((+5.4485119E+02) + (+1.0420076E-01) \times X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT
 SIGNIFICANCE OF R = NOT SIGNIFICANT
 SIGNIFICANCE OF t = NOT SIGNIFICANT
 DEGREES OF FREEDOM = 397
 TEST CONDITIONS = AMB TEMP/RH
 $G_1 = +1.8265238E+01$
 $S_0 = +5.3751371E-02$
 $S_1 = +1.8202278E+01$



STAGE I WING 142 DIFFERENTIAL SCANNING CALORIMETER EXOTHERM 1 PEAK TEMP

FIGURE 56

$F = +1.2673663E+01$
 $R = +1.7588632E-01$
 $I = +3.5600089E+00$
 $N = 399$
 STORAGE CONDITIONS = AMB TEMP/AH
 DEGREES OF FREEDOM = 397
 $Y = ((+5.7944381E+02) + (+2.0886812E-01) * X)$
 $G = +2.0157411E+01$
 $S_0 = +5.8670675E-02$
 $S_1 = +1.9868143E+01$



STAGE I WING 142 DIFFERENTIAL SCANNING CALORIMETER EXOTHERM 2 PEAK TEMP

FIGURE 57

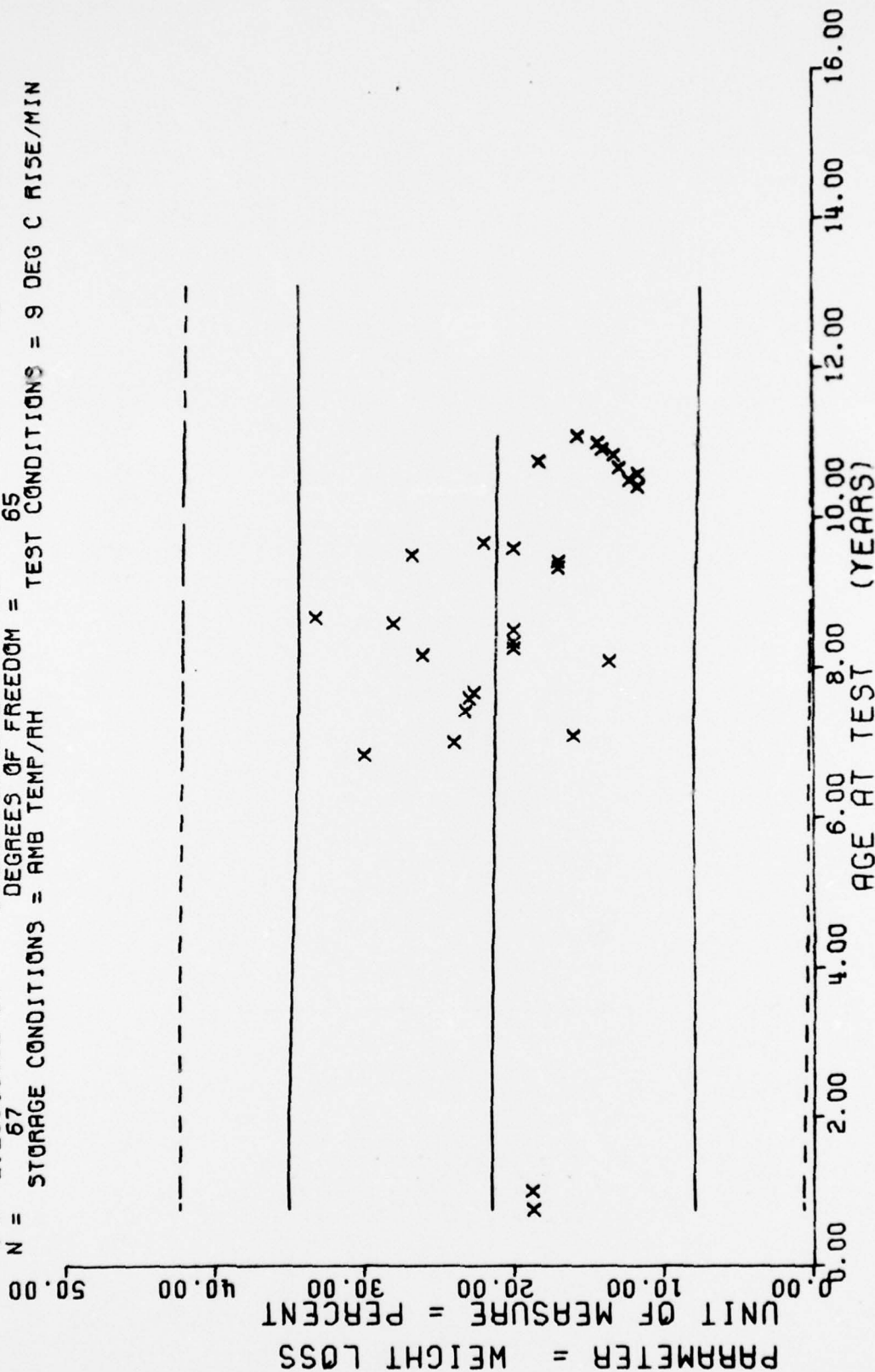
*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NP SAMPLES	AGE (MONTHS)	NP SAMPLES
9.0	2	120.0	1
12.0	4	131.0	2
22.0	1	132.0	2
34.0	1	133.0	1
35.0	1		
39.0	2		
41.0	2		
42.0	5		
47.0	4		
58.0	7		
59.0	2		
100.0	1		
102.0	3		
103.0	6		
104.0	5		
112.0	1		
113.0	1		
114.0	2		
115.0	1		
116.0	1		
125.0	1		
126.0	2		
127.0	1		
128.0	2		
129.0	1		

WING 162 STAGE 1 TGA PERCENT WEIGHT LOSS AT 250 DEG C. 9 DEG C RISE/MIN

This sample size summary is applicable to figure 58

$Y = ((+2.1635782E+01) + (-5.3019989E-03) * X)$
 $F = +5.2390702E-02$ SIGNIFICANCE OF F = NOT SIGNIFICANT $G = +6.9104084E+00$
 $R = -2.8378894E-02$ SIGNIFICANCE OF R = NOT SIGNIFICANT $S_1 = +2.3163945E-02$
 $I = +2.2889015E-01$ SIGNIFICANCE OF I = NOT SIGNIFICANT $S_2 = +6.9605579E+00$
 $N = 67$ DEGREES OF FREEDOM = 65
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 9 DEG C RISE/MIN



*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	AGE (MONTHS)	AGE (MONTHS)	AGE (MONTHS)
9.0	120.0	1	1
12.0	127.0	1	1
22.0	134.0	0	0
24.0	139.0	5	5
25.0	130.0	8	8
29.0	131.0	0	0
31.0	132.0	5	5
32.0	133.0	4	4
37.0	134.0	5	5
53.0	135.0	10	10
59.0	136.0	14	14
100.0	137.0	8	8
101.0	138.0	2	2
102.0	139.0	5	5
103.0			
104.0			
105.0			
106.0			
107.0			
112.0			
113.0			
114.0			
115.0			
116.0			
125.0			

WING 162 STAGE 1 TGA PERCENT WEIGHT LOSS AT IGNITION, 9 DEG C FISE/MIN

This sample size summary is applicable to figure 59

$Y = ((+2.9578785E+01) + (+3.6563612E-02) * X)$
 SIGNIFICANCE OF F = NOT SIGNIFICANT $\sigma_r = +8.2443176E+00$
 SIGNIFICANCE OF R = NOT SIGNIFICANT $S_e = +2.0725160E-02$
 SIGNIFICANCE OF t = NOT SIGNIFICANT $S_t = +8.1968847E+00$
 DEGREES OF FREEDOM = 181
 STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 9 DEG C RISE/MIN

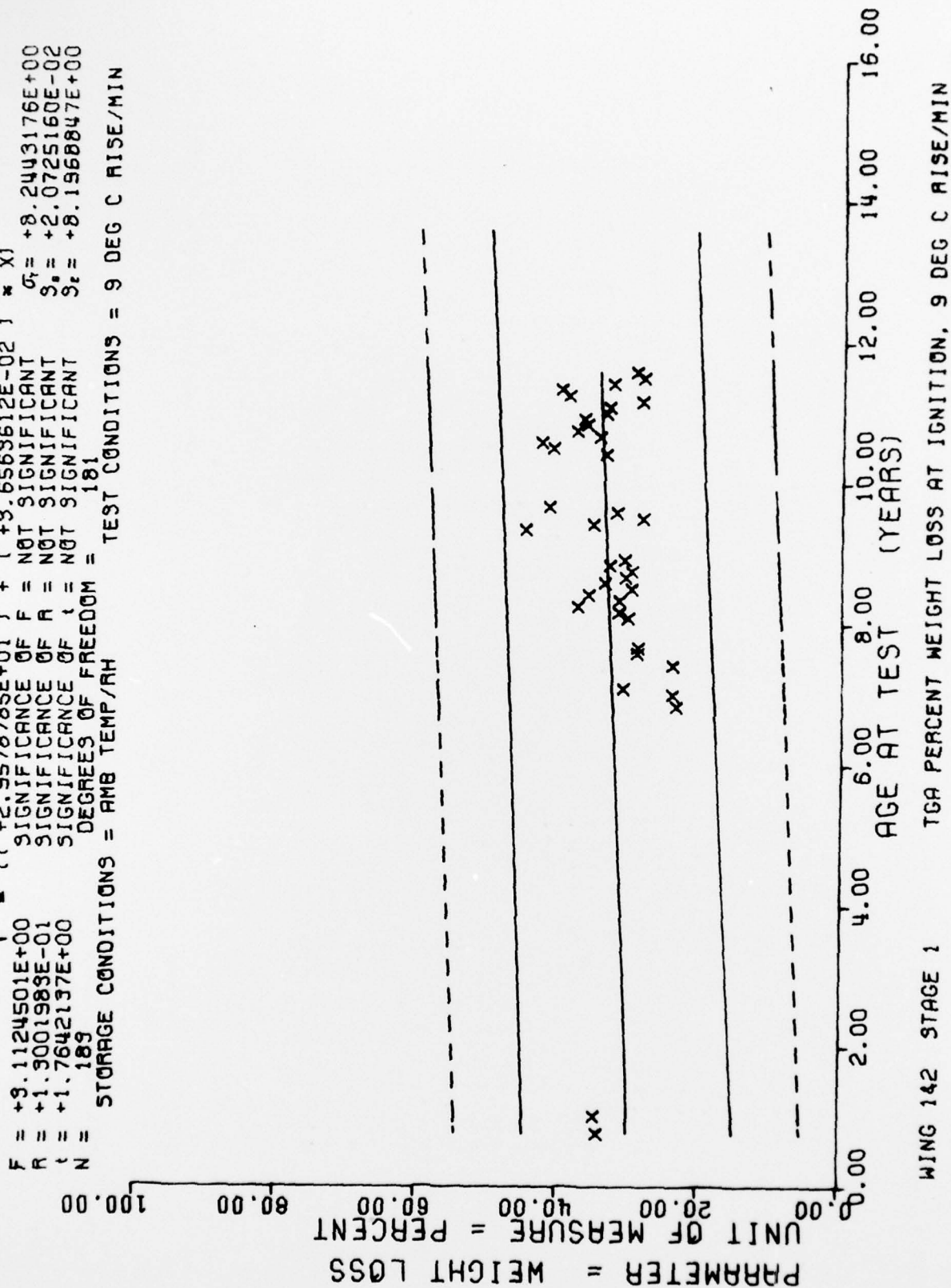


FIGURE 59

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Fleet Support Dept., Propulsion	
System Development Division, Code FS7	
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8621 Georgia Avenue	
Silver Springs, MA 20910	
Naval Plant Branch Representative	1
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Bacchus Works	
Manga, Utah 84044	

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1. REPORT NUMBER 367(77)	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Propellant Surveillance Report LGM-30 A & B Stage I, TP-H1011		5. TYPE OF REPORT & PERIOD COVERED Test Results-Semi Annual
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) John A. Thompson		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Propellant Lab Section Directorate of Maintenance OO-ALC Hill AFB, Utah 84406		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS MMEMP Project M72632-5MP116P
11. CONTROLLING OFFICE NAME AND ADDRESS Service Engineering Division Directorate of Material Management OO-ALC Hill AFB, Utah 84406		12. REPORT DATE April 1977
		13. NUMBER OF PAGES 112
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for Public Release, Distribution Unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Solid Propellant Minuteman		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 A and B First Stage Minuteman Motors. This report is the twelfth time that a statistical approach has been used to analyze First Stage bulk carton propellant. Testing was accomplished in accordance with MMEMP Project M72632-5MP116P. The purpose of testing was to determine and provide early warning of any serious degradation trends occurring in the propellant for service life predictions. An analysis of all parameters indicates that no potential problems are expected in the propellant		

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for at least two years past the oldest data point.

Data stored in the G085 System were plotted utilizing the IBM 360-65 Computer and Cal-Comp Plotter. The data range at any age can be found by suitable inquiry of the G085 System.

Each point on the regression plot represents the mean of all samples at that particular age. The number of specimens at each point is indicated on the sample size summary sheet accompanying each regression plot or group of regression plots.